IN THE UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF TEXAS

TYLER DIVISION

Blue Spike, LLC, *Plaintiff*, v. Texas Instruments, Inc., et al., *Defendants*.	§ § § § § § § § §	CASE NO. 6:12-cv-499-MHS-CMC LEAD CASE Jury Trial Demanded

DECLARATION OF AHMED H. TEWFIK, PH.D.
REGARDING CLAIM CONSTRUCTION

I, Ahmed H. Tewfik, do hereby state and declare the following:

I. Background

A. I am the Chairman of the Electrical and Computer Engineering Departments at The University of Texas at Austin.

B. I hold a B.S.E.E. from Cairo University, Cairo Egypt, in 1982, an M.S.E.E. in 1984 and Sc.D. in 1987, both from the Massachusetts Institute of Technology. I am also a Fellow of the IEEE, and was a distinguished lecturer of the IEEE Signal Processing Society from 1997 to 1999. In 2000, I received the IEEE Third Millennium Award. In addition, I was awarded the E. F. Johnson professorship of Electronic Communications in 1993, the Taylor Faculty Development Award from the Taylor Foundation in 1992 and an NSF Research Initiation Award in 1990.

My C.V., attached as Exhibit A, provides a detailed account of my educational and professional background.

a. Along with the more detailed experience listed in my C.V., I note the following experience that is uniquely situated to the technology at issue here. Between August 1997 and August 2001, I was the founder and CEO of Cognicity, Inc. ("Cognicity"). Cognicity developed products in the field of watermarking, which is related to the technology in this litigation. Exhibit B. In addition to developing products in this field, I also participated in the nascent standards setting organization, Secure Digital Music Initiative ("SDMI") meetings involving secure music distribution. Exhibit C

b. I am a named inventor on twenty-three patents, including the following fifteen relating to digital watermarking techniques:

1. U.S. Patent No. 6,031,914, "Method and apparatus for embedding data, including watermarks, in human perceptible images," A. H. Tewfik, M. D. Swanson and B. Zhu, February 2000.
2. U.S. Patent No. 6,061,793 "Method and apparatus for embedding data, including watermarks, in human perceptible sounds," A. H. Tewfik, M. D. Swanson, B. Zhu and L. Boney, May 2000.
3. U.S. Patent No. 6,226,387 "Method and apparatus for scene-based video watermarking," A. H. Tewfik, M. D. Swanson, B. Zhu and L. Boney, May 2001.
4. U.S. Patent No. 6,272,634, "Digital watermarking to resolve multiple claims of ownership," A. H. Tewfik, M. D. Swanson and B. Zhu,

August 2001.

5. U.S. Patent No. 6,282,299 "Method and apparatus for video watermarking using perceptual masks," A. H. Tewfik, M. D. Swanson and B. Zhu, August 2001.
6. U.S. Patent No. 6,442,283 "Multimedia data embedding," A. H. Tewfik, M. D. Swanson and B. Zhu, August 2002.
7. U.S. Patent No. 6,751,337 "Digital watermark detecting with weighting functions," A. H. Tewfik, M. D. Swanson and B. Zhu, June 15, 2004.
8. U.S. Patent No. 6,915,481, "Transactional watermarking," A. H. Tewfik, M. D. Swanson and B. Zhu, July 2005.
9. U.S. Patent No. 7,366,908, "Digital watermarking with content dependent keys and autocorrelation properties for synchronization," A. H. Tewfik, April 2008.
10. U.S. Patent No. 7,454,034, "Digital watermarking of tonal and non-tonal components of media signals," A. H. Tewfik, M. D. Swanson and B. Zhu, November 2008.
11. U.S. Patent No. 8,098,637, "Embedding data in and detecting embedded data from video objects," A. H. Tewfik, January 2012.
12. U.S. Patent No. 8,103,051, "Multimedia data embedding and decoding," A. H. Tewfik, M. D. Swanson and B. Zhu, January 2012.
13. U.S. Patent No. 8,131,007, "Watermarking using multiple watermarks and keys, including keys dependent on the host signal," A. H. Tewfik, B. Zhu and M. D. Swanson, March 2012.
14. U.S. Patent No. 8,155,375, "Video watermarking using temporal analysis," A. H. Tewfik, B. Zhu and M. D. Swanson, April 2012.
15. U.S. Patent No. 8,306,811, "Embedding data in audio and detecting embedded data in audio," A. H. Tewfik, B. Zhu and M. D. Swanson, November 2012.

c. I have presented on numerous occasions including:

- IEEE Wireless 802 Standards Meetings Presentations - March, May, and July 2003.
- Plenary Speaker, IEEE-Cairo University Cairo International Biomedical Engineering Conference, Cairo, Egypt, December 2012.
- Plenary Speaker, IEEE Workshop on Signal Processing Systems, Beirut, Lebanon, October 2011.
- Elected VP Technical Directions, IEEE Signal Processing Society, 2009.
- Plenary Speaker, IEEE Int. Symposium on Signals, Circuits and Systems, Iasi, Romania, July 2007.
- Plenary Speaker, Cairo International Biomedical Engineering Conference, Cairo, Egypt, December 2006.
- Elected to Board of Governors, IEEE Signal Processing Society, 2005.

- Plenary Speaker, SampTA05: Sampling Theory and Applications, 2005, Samsun, Turkey, July 2005

C. I have been retained by Blue Spike, LLC in this matter. I will be compensated for my time working on this matter at the rate of $350 per hour.

II. Legal Standards

A. I am not an attorney and I will offer no opinions on the law. I am, however, informed on several principles concerning claim construction, which I have used in arriving at my conclusions in this declaration.

B. First, an issued patent is presumed valid.

C. Second, each patent claim is considered separately.

D. Third, all the words in the claims matter such that each word must be given a meaning.

E. Fourth, when trying to determine what the terms in the claim mean, there is a hierarchy of materials to consider. We begin with the words of the claim. Next, we examine the intrinsic record, including the patent specification and prosecution history. Finally, if necessary, we consult extrinsic evidence, such as dictionary definitions and learned treatises.

F. Fifth, the law permits so-called "means plus function" claims. These are claims that use functional language without structure in the claims. Such claims typically have the phrase "means for" in them, with the function following the phrase. The trade off for using such functional language in the claims is that corresponding structure for the claimed "means" or function must be provided in the patent specification. In cases involving computer-implemented inventions, corresponding structure may be expressed as a software algorithm, for example, as either a mathematical formula, prose, or as a flow chart.

G. Sixth, patent claims are interpreted as they would be understood by a person of ordinary skill in the art at the time of the invention. When one of skill in the art understands with reasonable certainty the bounds of a claim in light of the specification, that claim is definite. *Nautilus, Inc. v. Biosig Instruments, Inc*., 134 S. Ct. 2120 (2014).

III. Scope of Work

A. I have reviewed U.S. Patent Nos. 7,346,472 (the "'472 patent"), 7,660,700 (the "'700 patent"), 7,949,494 (the "'494 patent"), and 8,214,175 (the "'175 patent") (collectively, the "Asserted Patents," or "patents-in-suit") and the related prosecution history. I have also reviewed the claim construction disclosures exchanged between the parties.

B. I was requested to consider issues regarding the construction of the

claims at issue in this litigation and address the following topics:

1. The level of skill of persons who would have worked in the field in the 2000 time frame; and

2. How such persons would have understood the meaning and scope of these claims.

IV. Level of Skill in the Art

A. A person of ordinary skill in the art in the field of the patents-in-suit would have a Master's degree in electrical engineering, computer science or computer engineering, or equivalent experience, as well as two years' experience in the field of digital signal processing.

V. Claim Construction Issues

A. Again, I am not a lawyer but have been informed on "definiteness" requirements of patent claims under the Patent Law. The specific requirement I have been asked to address in this declaration is found in 35 U.S.C. § 112, Paragraph 2, which provides:

> "The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."

B. I understand that the Parties dispute whether certain terms are governed by "means plus function" principles. If the Court determines that "comparing device" is governed by The "means plus function" limitations I have been asked to consider also must satisfy the same statutory requirement of 35 U.S.C. § 112, Paragraph f, which states:

> "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

C. Applying the claim construction rules described above, I provide the remarks and analysis below, as viewed by a person of ordinary skill in the art at the time of the invention, regarding terms in the patents-in-suit:

1. *"abstract"*

Based on my review of the specification and as one of skill in the art, I have reasonable certainty of the scope of the invention where the term "abstract" is used. The specification provides context for this term in numerous places. First, the '175 Patent

specification[1] provides several general descriptions that bound the scope of "abstract":

- As a general improvement over the art, the present invention incorporates what could best be described as "computer-acoustic" and "computer-visual" modeling, where *the signal abstracts are created using data reduction techniques to determine the smallest amount of data, at least a single bit, which can represent and differentiate two digitized signal representations for a given predefined signal set.*

  Col. 10, lines 10-16 (emphasis added)

- The present invention generally contemplates a signal recognition system that has at least five elements.

  Col. 8, lines 3-4.

  - The third element is the feature selector, which is able to *analyze a selected object and identify perceptual features of the object that can be used to uniquely describe the selected object*.

    Col. 8, lines 44-47 (emphasis added).

- The present invention concerns itself with perceptible relationships only to the extent that efficiencies can be achieved both in accuracy and speed with enabling logical relationships between an original signal and its abstract.

  Col. 9, lines 43-47.

I also observe that the following sections provide further clarity in discussing the balance between compressing or reducing a signal while maintaining a "perceptual relationship" to the original signal:

- While there are many approaches to data reduction that can be utilized, a primary concern is the ability to reduce the digital signal in such a manner as to retain a "perceptual relationship" between the original signal and its data reduced version. This relationship may either be mathematically discernible or a result of market-dictated needs. The purpose is to afford a more consistent means for classifying signals than proprietary, related text-based approaches. A simple analogy is the way in which a forensic investigator uses a sketch artist to assist in determining the identity of a human.

[1] All four patents-in-suit share a common specification. Citations to the '175 Patent are representative.

Col. 3, line 64 - Col. 4, line 6.

- So long as there exist computationally inexpensive ways of identifying an entire signal with some fractional representation or relationship with the original signal, or its perceptually observable representation, we envision methods for faster and more accurate auditing of signals as they are played, distributed or otherwise shared amongst providers (transmitters) and consumers (receivers). The ability to massively compress a signal to its essence—which is not strictly equivalent to "lossy" or "lossless" compression schemes or perceptual coding techniques, but designed to preserve some underlying "aesthetic quality" of the signal—represents a useful means for signal analysis in a wide variety of applications. The signal analysis, however, must maintain the ability to distinguish the perceptual quality of the signals being compared.

  Col. 7, lines 4-17.

- The challenge is to maximize the ability to sufficiently compress a signal to both retain its relationship with the original signal while reducing the data overhead to enable more efficient analysis, archiving and monitoring of these signals.

  Col. 9, lines 48-52

One of the embodiments in the specification addresses abstract in the context of music, although as one of skill in the art I would also find it applicable to image or video signals. Specifically, the following embodiment addresses identifying and selecting characteristics that would remain constant between multiple versions of the same song (which would also apply to an image or video):

- In one embodiment of the invention, the abstract of a signal may be generated by the following steps: 1) analyze the characteristics of each signal in a group of audible/perceptible variations for the same signal (e.g., analyze each of five versions of the same song—which versions may have the same lyrics and music but which are sung by different artists); and 2) *select those characteristics which achieve remain relatively constant (or in other words, which have minimum variation) for each of the signals in the group.* Optionally, the null case m ay be defined using those characteristics [,]which are common to each member of the group of versions.

Col. 4, lines 7-17 (emphasis added).

Finally, the specification provides specific, yet non-limiting, approaches to compressing or reducing digital signals that would be known to those of skill in the art:

> - Linear predictive coding (LPC), z-transform analysis, root mean square (rms), signal to peak, may be appropriate tools to measure signal characteristics, but other approaches or combinations of signal characteristic analysis are contemplated. While such signal characteristics may assist in determining particular applications of the present invention, a generalized approach to signal recognition is necessary to optimize the deployment and use of the present invention.
>
> Col. 4, lines 24-32.

Accordingly, in view of the above specification sections and the context that the specification as a whole provides, I have reasonable certainty regarding the scope of the claim term "abstract".

b. "comparing device"

I understand that the parties dispute whether a "comparing device" is governed by means plus function standards. I offer the following opinion in the event the Court determines that means plus function standards govern this term.

As one of ordinary skill in the art, the algorithm set forth in the specification is sufficient to define the structure and therefore the bounds of the claim are understandable to me. Specifically, it is clear to me that this phrase includes well-known software and hardware in the art to compare. Such a disclosure clearly provides sufficient information to determine the logical process for performing the function.

> A computerized system for monitoring and analyzing at least one signal is also disclosed, Which system comprises: a processor for creating an abstract of a signal using selectable criteria; a first input for receiving at least one reference signal to be monitored, the first input being coupled to the processor such that the processor may generate an abstract for each reference signal input to the processor; a reference database, coupled to the processor, for storing abstracts of each at least one reference signal; a second input for receiving at least one query signal to be analyzed, the second input being coupled to the processor such that the processor may generate an abstract for each query signal; and *a comparing device, coupled to the reference database and to the second input, for comparing an abstract of the at least one query signal to the abstracts stored in the reference*

database to determine if the abstract of the at least one query signal matches any of the stored abstracts.

Further, an electronic system for monitoring and analyzing at least one signal is disclosed, Which system comprises: a first input for receiving at least one reference signal to be monitored, a first processor for creating an abstract of each reference signal input to the first processor through the first input; a second input for receiving at least one query signal to be analyzed, a second processor for creating an abstract of each query signal; a reference database for storing abstracts of each at least one reference signal; *and a comparing device for comparing an abstract of the at least one query signal to the abstracts stored in the reference database to determine if the abstract of the at least one query signal matches any of the stored abstracts.*

Col. 3, lines 32-60.

The fourth element is *the comparing device[,] which is able to compare the selected object using the features selected by the feature selector to the plurality of signals in the reference database to identify which of the signals matches the monitored signal.* Depending upon how the information of the plurality of signals is stored in the reference database and depending upon the available computational capacity (e.g., speed and efficiency), the exact nature of the comparison will vary. For example, the comparing device may compare the selected object directly to the signal information stored in the database. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector and then compare the selected object to the processed signal information. Alternatively, the comparing device may need to process the selected object using input from the feature selector and then compare the processed selected object to the signal information. Alternatively, the comparing device may need to process the signal information stored in the database using input from the feature selector, process the selected object using input from the feature selector, and then compare the processed selected object to the processed signal information.

Col. 8:58-9:12

Other elements may be added to the system or incorporated into the five elements identified above. For example, an error handler may be incorporated into the comparing device. If the comparing device identifies multiple signals which appear to contain the object being sought for analysis or monitoring, the error handler may offer further processing in order to identify additional qualities or features in the selected object such that only one of the set of captured signals is found to contain the further analyzed selected object that actually conforms with the object thought to have been transmitted or distributed.

Moreover, one or more of the five identified elements may be implemented with

software that runs on the same processor, or which uses multiple processors. In addition, the elements may incorporate dynamic approaches that utilize stochastic, heuristic, or experience-based adjustments to refine he signal analysis being conducted Within the system, including, for example, the signal analyses being performed Within the feature selector and the comparing device. This additional analysis may be viewed as filters that are designed to meet the expectations of accuracy or speed for any intended application.

Col. 9:20-40

Accordingly, the bounds of this claim element are clear to me as one of ordinary skill in the art and it is my opinion that others of ordinary skill in the art would also find sufficient the disclosure of the logical processes that correspond to the function of comparing.

Sworn this 19th day of September, 2014, Austin, Texas, by _____
Ahmed Tewfik, Ph.D.